Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Use of Spectrum Bands Above 24 GHz For Mobile Radio Services	)	GN Docket No. 14-177
	)	
	)	
Amendment of Parts 1, 22, 24, 27, 74, 80, 90, 95, and 101 To Establish Uniform License Renewal, Discontinuance of Operation, and Geographic Partitioning and Spectrum Disaggregation Rules and Policies for Certain Wireless Radio Services	)	WT Docket No. 10-112

COMMENTS OF T-MOBILE USA, INC.

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T-Mobile USA, Inc. ("T-Mobile")[1/] submits these comments in response to the Third Further Notice of Proposed Rulemaking ("*Third Further Notice*")[2/] in the above-referenced proceedings, in which the Commission proposes to make additional millimeter wave band spectrum available for Fifth Generation ("5G") wireless services.

I. INTRODUCTION AND SUMMARY

T-Mobile applauds the Commission's continued efforts to make millimeter wave spectrum available for 5G use and to "facilitate access to additional low-band, mid-band, and high-band spectrum for the benefit of American consumers."[3/] T-Mobile is particularly encouraged that the Commission proposes to allocate additional millimeter wave spectrum for licensed wireless broadband – especially spectrum that, like the 25.25-27.5 GHz ("26 GHz") and

1/ T-Mobile USA, Inc. is a wholly-owned subsidiary of T-Mobile US, Inc., a publicly traded company.

2/ *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, et al.*, Third Report and Order, Memorandum Opinion and Order, and Third Further Notice of Proposed Rulemaking, FCC-18-73 (rel. Jun. 8, 2018).

3/ *Third Further Notice* ¶ 2.

42-42.5 GHz ("42 GHz") bands, has no other significant non-federal uses. The Commission should not stop here. As the Commission recognizes, making millimeter wave "spectrum available for wireless uses is vital to ensuring continued American leadership in wireless broadband."[4/] The Commission should therefore make more spectrum available in future phases of this proceeding and auction as many of the spectrum bands together as feasible. Specifically, the Commission should consider making available other bands that have been proposed either by the Commission or by others, such as the 31.8-33.4 GHz band ("32 GHz band"), 50.4-52.6 GHz band ("50 GHz band"), 23.15-23.6 GHz band,[5/] 42.5-43.5 GHz band,[6/] and 45.5-47 GHz band.[7/]

To help establish a U.S. leadership position in 5G, the Commission should dedicate as much of the target spectrum in this proceeding as possible to exclusive terrestrial wireless use, the platform that has made the U.S. wireless ecosystem the world leader in 4G LTE. The Commission should also impose as few limitations on exclusive licensed commercial use of the spectrum as possible by federal use or by other services, such as satellite systems. Specifically, the Commission should –

- Authorize Upper Microwave Flexible Use Service ("UMFUS") operations in the 42 GHz band and issue exclusive licenses in the band in 100 megahertz blocks on a Partial Economic Area ("PEA") basis.
- Structure the rules for sharing between federal and non-federal users in the Lower and Upper portions of the 37 GHz band (37-37.6 GHz and 37.6-38.6 GHz, respectively) to promote certainty and the greatest amount of commercial use.

4/ *Id.* ¶ 2.

5/ Recommended by the Inter-American Telecommunications Commission ("CITEL") for consideration at WRC-15. This band may also be appropriate for a future phase of the *Mid Band* proceeding. *See Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, GN Docket No. 18-122.

6/ Recommended by the International Telecommunications Union ("ITU") for additional study. WORLD RADIOCOMMUNICATION CONFERENCE (WRC-15), PROVISIONAL FINAL ACTS, at 426 (2015), http://www.itu.int/dms_pub/itu-r/opb/act/R-ACT-WRC.11-2015-PDF-E.pdf.

7/ Recommended by CITEL and ITU.

- Authorize licenses for non-federal users in the Lower 37 GHz band in a manner that meaningfully supports mobile operations.
- Authorize UMFUS operations in the 26 GHz band, issue exclusive licenses in the band in 100 megahertz blocks on a PEA basis, and reject requests from Elefante Group ("Elefante") and proponents of similar high altitude platform services ("HAPS") to limit UMFUS use of the band.
- Authorize the 50.4-52.6 GHz band for UMFUS use and ensure that any actions granting additional limited access to the Fixed Satellite Service ("FSS") do not inhibit terrestrial mobile use of the band.

II. THE COMMISSION SHOULD MAKE THE 42 GHz BAND AVAILABLE FOR FLEXIBLE USE ON AN EXCLUSIVE LICENSED BASIS

The 42 GHz band is currently allocated for non-federal fixed and mobile use on a primary basis, although the Commission has not yet adopted service rules for terrestrial operations. As part of the *Further Notice of Proposed Rulemaking* in this proceeding,[8/] the Commission sought comment on authorizing flexible use of the 42 GHz band under the Part 30 rules, among other issues,[9/] but it has thus far taken no action on the band. As the Commission notes, the RAY BAUM's Act of 2018 directs the Commission to consider service rules to authorize mobile or fixed terrestrial wireless operations in the 42 GHz band, including whether the band should be used for licensed or unlicensed purposes or some combination thereof and whether to permit licensed operations on a shared basis.[10/] The Commission should take this opportunity to promptly make the band available for exclusive licensed use.

Licensing Under the Part 30 Rules. As T-Mobile detailed in its previous comments in this proceeding, it supports the Commission's proposal to authorize fixed and mobile operations

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8/ *Use of Spectrum Bands Above 24 GHz For Mobile Radio Service; et al.*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd. 8014 (2016) ("*FNPRM*").

9/ *FNPRM* ¶¶ 403-407.

10/ *See* Consolidated Appropriations Act of 2018, Pub. L. No. 115-141, 132 Stat. 348, DIVISION P – Repack Airwaves Yielding Better Access for Users of Modern Services (RAY BAUM's) Act of 2018, Title VI Making Opportunities for Broadband Investment and Limiting Excessive and Needless Obstacles for Wireless (MOBILE NOW) Act, § 601, *et seq.* (2018); *Third Further Notice* ¶ 48.

in the 42 GHz band under the Part 30 rules.[11/] The Commission is correct that the "Part 30 UMFUS [r]ules provide the best opportunity to provide commercial wireless broadband service to the public in this band."[12/] And as the Commission acknowledges, the record shows strong support for UMFUS use in the 42 GHz band.[13/]

To promote the greatest amount of investment and innovation in the 42 GHz band, the Commission should also adopt its proposal to use geographic area licensing.[14/] Exclusively licensed spectrum is the foundation of today's robust mobile wireless ecosystem. Wireless carriers have made and continue to make massive investments in licensed spectrum,[15/] and these investments have facilitated the creation of networks capable of supporting greater speeds and functionalities and have led to new, more powerful and sophisticated devices. Licensed spectrum is also a critical economic driver – for instance, every 100 megahertz of licensed spectrum made available adds $31 billion to the US. Gross Domestic Product and supports

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11/ *See* Comments of T-Mobile USA, Inc., GN Dkt. No. 14-177, *et al*., at 7, 13 (filed Sept. 30, 2016) ("T-Mobile *FNPRM* Comments").

12/ *Third Further Notice* ¶ 52.

13/ *Id.* ¶ 49 ("In response to our FNPRM, most commenters generally supported establishing service rules that would allow the band to be flexibly licensed for fixed and mobile operations under Part 30."); *see also* Reply Comments of Intel Corporation, GN Dkt. No. 14-177, *et al*., at 6 (filed Oct. 31, 2016); Comments of AT&T, GN Dkt. No. 14-177, *et al*., at 9 (filed Sept. 30, 2016); Comments of Verizon, GN Dkt. No. 14-177, *et al*., at 3 (filed Sept. 30, 2016); Comments of CTIA, GN Dkt. No. 14-177, *et al*., at 10-13 (filed Sept. 30, 2016); Comments of 5G Americas, GN Dkt. No. 14-177, *et al*., at 4 (filed Sept. 30, 2016); Comments of Ericsson, GN Dkt. No. 14-177, *et al*., at 11 (filed Sept. 30, 2016); Comments of Huawei Technologies, Inc. (USA) and Huawei Technologies Co., Ltd., GN Dkt. No. 14-177, *et al*., at 6 (filed Sept. 30, 2016).

14/ *See FNPRM* ¶ 403.

15/ Wireless carriers have made over $226 billion in capital investments since 2010, a figure which does not include tens of billions in carrier expenditures on spectrum auctioned by the Commission. *See State of Wireless 2018*, CTIA, https://api.ctia.org/wp-content/uploads/2018/07/CTIA_State-of-Wireless-2018_0710.pdf (last accessed Aug. 7, 2018). For instance, there were $41.3 billion in net bids made in the AWS-3 auction alone. *See Advanced Wireless Services (AWS-3) Fact Sheet*, FCC (last accessed Aug. 17, 2018) http://wireless.fcc.gov/auctions/default.htm?job=auction_factsheet&id=97.

approximately 1 million new jobs.[16] The Commission should therefore provide the greatest opportunity to extend the success of today's wireless ecosystem and license the 42 GHz band on an exclusive basis.

The Commission should reject the use of sharing techniques such as Spectrum Access Systems or use-it-or-share it approaches, both of which would diminish the benefits of designating spectrum on an exclusive licensed basis.[17/] Unlike the strong track record of exclusive licensed service, there is no evidence that database-centric sharing techniques producing effective results. Similarly, use-it-or-share-it protocols remain untested. For example, the Commission has not addressed use-it-or-share it mechanisms in instances where the licensee seeks to use its spectrum in cases where a sharer has customers it is required to displace from the shared spectrum. Until the Commission and users have more experience with these approaches and these sharing mechanisms have proven effective and efficient, they should not be adopted for use in the target millimeter wave bands.

The Commission should issue geographic area licenses on a PEA basis. Except for in the 28 GHz band, the Commission has either adopted or proposed to adopt rules that would make PEAs the license area for millimeter wave spectrum.[18/] Adopting PEAs for the 42 GHz band will

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16/ *See $31 Billion U.S. GDP and 1 Million Jobs Added by Wireless Industry for Every 100 MHz Licensed*, Press Release, CTIA (Jan. 26, 2016), https://www.ctia.org/news/31-billion-u-s-gdp-and-1-million-jobs-added-by-wireless-industry-for-every-100-mhz-licensed-spectrum; *see also Licensed Spectrum: The Key to Continuing America's Wireless Leadership and Growing our Economy*, CTIA (Feb. 2017), https://api.ctia.org/docs/default-source/default-document-library/ctia-white-paper-licensed-spectrum.pdf. For further detail on the benefits of licensed spectrum for consumers and the American economy, *see* Reply Comments of T-Mobile USA, Inc., GN Dkt. No. 14-177, *et al.*, at 3-7 (filed Oct. 31, 2016).

17/ *See Third Further Notice* ¶ 52 (seeking comment on whether sharing should be permitted in the 42 GHz band).

18/ *See* 47 C.F.R. § 30.5 (establishing PEAs as the license area in the 24 GHz, Upper 37 GHz, 39 GHz, and 47 GHz bands); *Third Further Notice* ¶ 89 (seeking comment on adopting PEAs as the license area for UMFUS licenses in the 26 GHz band).

permit providers to rationalize their millimeter wave band spectrum assets on a consistent geographic area basis.

Band Plan. The Commission should license the 42 GHz band in five 100 megahertz blocks, consistent with its proposals for the Upper 37 GHz, 39 GHz, and 47 GHz bands.[19/] It is reasonable to make 100 megahertz channels the flexible building blocks for millimeter wave networks. As the Commission has noted, 100 megahertz channels are consistent with 3rd Generation Partnership Project ("3GPP") standards in the millimeter wave bands.[20/] The Commission's efforts to make additional millimeter wave band spectrum available will help ensure that multiple entrants can take advantage of these bands while ensuring that channel sizes are large enough to support 5G services.[21/]

Federal Allocation. As T-Mobile previously stated,[22/] the Commission should reject its proposal to add federal fixed and mobile allocations into this band.[23/] No federal agency has requested access to the spectrum and there has been no demonstration that the spectrum is needed for additional federal operations. Any further federal use would unnecessarily limit needed commercial access to the band. If federal agencies determine in the future that they

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19/ *See Third Further Notice* ¶ 57; *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, et al.,* Fourth Further Notice of Proposed Rulemaking, FCC 18-110, ¶¶ 9-12 (rel. Aug. 3, 2018) ("*Fourth Further Notice*").

20/ *See Fourth Further Notice* ¶ 10, n.27 (noting that "100 megahertz channels are supported in the 3GPP's 5G specifications for the 39 GHz band").

21/ *See, e.g.*, Comments of T-Mobile USA, Inc., GN Docket No. 14-177 *et al.*, 11 (filed Jan. 27, 2016) ("[B]lock sizes must be proportional to the amount of spectrum available, take into consideration a band's location in the spectrum and promote in-band competition where possible."); Comments of T-Mobile USA, Inc., GN Docket No. 13-185, 28 (filed Sep. 18, 2013) ("T-Mobile supports the Commission's proposal to license the AWS-3 spectrum using five megahertz blocks."); Comments of T-Mobile USA, Inc., GN Docket No. 12-354, 3 (filed Dec. 5, 2013) (supporting the use of 10 megahertz blocks for Priority Access Licenses).

22/ T-Mobile *FNPRM* Comments at 15.

23/ *See Third Further Notice* ¶ 53; *FNPRM* ¶ 407.

require access to the band, they can do so through commercial arrangements with wireless licensees, just as federal agencies contract for other services today. Conducting a spectrum auction for non-federal users, generating revenue for U.S. taxpayers, allowing commercial providers to develop the spectrum, and later allowing non-federal users to provide services to federal agencies is more efficient that reserving access for federal users for non-specified needs. Moreover, Congress has recently taken action to encourage federal users to *vacate* spectrum in order to make more spectrum available for commercial use.[24/] Creating new federal allocations where there are none today, particularly where there is no stated need – as opposed to preserving sharing where federal use or allocations already exist – would be contrary to Congress's stated goals.

Protection of Radio Astronomy Service ("RAS") Operations. UMFUS operations in the 42 GHz band would be adjacent to RAS at 42.5-43.5 GHz. As the Commission notes, the National Academy of Sciences' Committee on Radio Frequencies ("CORF") and T-Mobile agree that RAS operations can be protected by limiting UMFUS operations near an RAS facility.[25/]

Because RAS operates at a limited number of known fixed remote locations,[26/] the Commission could establish exclusion or coordination zones to avoid interference to RAS

[24/] *See* Consolidated Appropriations Act of 2018, Pub. L. No. 115-141, 132 Stat. 348, DIVISION P – Repack Airwaves Yielding Better Access for Users of Modern Services (RAY BAUM's) Act of 2018, Title VI Making Opportunities for Broadband Investment and Limiting Excessive and Needless Obstacles for Wireless (MOBILE NOW) Act, § 601, *et seq.* (2018) (requiring that NTIA give priority to reallocation options that assign spectrum for exclusive, non-federal use over options that involve sharing when transitioning spectrum from federal to commercial use).

[25/] *See Third Further Notice* ¶ 56; Comments of CORF-National Academy of Sciences, GN Dkt. No. 14-177, *et al.*, at 9 (filed Sept. 29, 2016) ("CORF *FNPRM* Comments"); T-Mobile *FNPRM* Comments at 13.

[26/] *See Third Further Notice* ¶ 55 (listing observatories where RAS observations are made).

locations.[27/] And because there are relatively few, remote sites, exclusion or coordination zones will not likely impact wireless industry efforts to serve most of the U.S. population. The Commission has taken a similar approach in the 37 GHz band, where there are facilities identified in the rules that require protection.[28/]

As CORF also agrees, the relevant received power spectrum density at the RAS receiver should be the parameters established by ITU-R RA.769.[29/] The power flux density ("PFD") limits adopted by the ITU are specifically intended to protect RAS operations from terrestrial operations, and Commission adoption of these PFD limits will also address potential interference to RAS.

Finally, current analyses regarding interference to RAS receivers in the high frequency range have highlighted that the interference risk comes from satellite services and airborne terrestrial operations such as HAPS – not terrestrial services.[30/] Ground-based terrestrial interference sources are usually in the far side-lobe region of the radio telescope antenna, and possibly further attenuated by the topography and clutter of the surroundings of the radio observatory. In contrast, interference by satellite transmitters is likely to be received via the main beam and inner side lobes, with considerably higher gain. Because interference from terrestrial transmitters to RAS receivers is almost always received through the antenna side

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27/ *See also* CORF *FNPRM* Comments at 9 ("[W]ith proper coordination, fixed-service operations at 42.0-42.5 GHz could probably protect RAS adequately.").

28/ *See* 47 C.F.R. §30.205.

29/ *See* CORF *FNPRM* Comments at 9.

30/ *See* RECOMMENDATION ITU-R RA.517-4: PROTECTION OF THE RADIO ASTRONOMY SERVICE FROM TRANSMITTERS OPERATING IN ADJACENT BANDS, INTERNATIONAL TELECOMMUNICATION UNION, at 3 (2006); *see also* REPORT ITU-R SM.2092: STUDIES RELATED TO THE IMPACT OF ACTIVE SERVICES ALLOCATED IN ADJACENT OR NEARBY BANDS ON EARTH EXPLORATION-SATELLITE SERVICE (PASSIVE), INTERNATIONAL TELECOMMUNICATION UNION, at 12-13 (2007).

lobes, the main beam response to interference need not be considered, making the risk to RAS from terrestrial operations addressable in the manner proposed by T-Mobile and CORF.[31/]

III. THE COMMISSION SHOULD PROMOTE MORE CERTAIN ACCESS TO THE LOWER 37 GHz BAND FOR BOTH FEDERAL AND NON-FEDERAL USERS

T-Mobile appreciates that the Commission seeks to promote innovation and sharing between federal and non-federal users in the Lower 37 GHz band. However, the structure contemplated by the *Third Further Notice* will not offer certainty to either. Instead of adopting the untested sharing mechanisms referenced in the *Third Further Notice*,[32/] the Commission should provide more certain access to spectrum for federal and non-federal users where both require it. Sharing need not be defined by unproven access mechanisms. Instead, the Commission should define sharing to mean that the rules will permit use of the spectrum by each class of entities when and if needed, as described more fully below.[33/]

31/ The Commission has also considered making available the 32 GHz band for flexible use under the Part 30 rules but has not yet proposed rules for that band. The 32 GHz band is similarly adjacent to RAS and other passive services. As T-Mobile has demonstrated via technical analysis in this proceeding, and as the National Radio Astronomy Observatory has agreed, the Commission can also protect RAS against potential 32 GHz band operations by adopting modest operating constraints on new 5G broadband services, such as exclusion or coordination zones. *See* T-Mobile USA, Inc. *Ex Parte*, GN Dkt. No. 14-177 *et al.* (filed Oct. 2, 2017); National Radio Astronomy Observatory *Ex Parte*, GN Dkt. No. 14-177 *et al.* (filed Feb. 7, 2018). Moreover, technical innovations in 5G systems will substantially limit the aggregate amount of out-of-band emissions adjacent passive services experience. The Commission should act promptly to make this band available as well.

32/ *See Third Further Notice* ¶¶ 62-66.

33/ In addition to resolving access mechanisms for the Lower 37 GHz band, the Commission must address the interoperability conditions imposed across the entire 37 GHz band. In a Petition for Reconsideration of the *First Report and Order*, T-Mobile asked the Commission to clarify that the operability requirements applicable to the 37-40 GHz band are limited to front-end radiofrequency capabilities, and if they are not so limited, then they do not apply to the Lower 37 GHz band. Alternatively, T-Mobile stated the Commission could decline to require operability throughout the entire 37-40 GHz band until sharing rules for the Lower 37 GHz are adopted. *See* Petition for Reconsideration of T-Mobile USA Inc., GN Docket No. 14-177 *et al*., at 10-11 (filed Dec. 14, 2016). Other parties sought similar relief. *See* Petition for Reconsideration Competitive Carriers Association, GN Docket No. 14-177 *et al*., at 14 (filed Dec. 14, 2016); 5G Americas Petition for Reconsideration, GN Docket No. 14-177 *et al.*, at 9-11 (filed Dec. 14, 2016); Petition for Reconsideration of Telecommunications Industry Association, GN Docket No. 14-177 *et al.*, at 5-7 (filed Dec. 14, 2016).

Federal Access to the Lower 37 GHz Band. The Commission, in consultation with NTIA, should require that government entities more specifically identify their spectrum needs in the Lower 37 GHz band, including the particular locations. These locations could be protected as part of the rules, just as the rules governing the entire 37 GHz band protect 14 military sites and three scientific sites identified by NTIA.[34/] The rules should incorporate a structure under which future federal use – beyond those needs identified today – could be permitted without diminishing the utility of the band for non-federal operations. Moreover, as noted above with respect to the 42 GHz band, federal agencies may secure access to spectrum in the Lower 37 GHz band through commercial arrangements with non-federal users.

In particular, the Commission, in consultation with NTIA, should consider rules under which future federal use – other than as specified in the rules adopted in this proceeding – would generally be permitted on a primary basis in remote areas. Use of the band by commercial systems is likely to be heaviest in urban locations, and T-Mobile's proposal would provide federal users with additional flexibility without materially affecting commercial systems.

To achieve the twin goals of preserving access to the Lower 37 GHz band for future federal operations and preserving a stable environment for commercial users, the rules could permit future federal use under three conditions. *First*, future stations could be deployed under siting policies – similar to those adopted for the 24 GHz, 28 GHz, 39 GHz, and 47 GHz bands – that permit non-commercial wireless use in specified areas. That will preserve commercial access to the spectrum in the most populated areas, where it is needed most. *Second*, future access, beyond initially specified locations, should be permitted only in a defined portion of the lower segment of the Lower 37 GHz band. Preserving the upper portion of the Lower 37 GHz

34/ *See* 47 C.F.R. §30.205.

band exclusively for commercial use without possible additional federal use will enhance the potential combined use of the Lower 37 GHz band and the licensed Upper 37 GHz band. *Third,* future federal access should be granted via static frequency assignment, rather than dynamic reassignment. This approach will create a more stable frequency environment for both federal and non-federal users of the Lower 37 GHz band.

The Commission also notes the possibility of establishing an aeronautical allocation in the Lower 37 GHz band for Department of Defense operations.[35/] While potential aeronautical use may be feasible in certain narrow circumstances or in a limited number of remote areas as suggested above, general aeronautical operations may not be compatible with the type of terrestrial uses described in the *Third Further Notice.*[36/] Before the Commission considers this proposal further, it should require federal users to demonstrate how aeronautical/terrestrial coordination will occur in a manner that will not limit current or future non-federal terrestrial use of the spectrum.

Non-Federal Access to the Lower 37 GHz Band. The Commission should structure the rules for access to the Lower 37 GHz band by non-federal users so that they best accommodate flexible use of the spectrum, including for mobile operations. Licensees should therefore be authorized for a geographic area of operation that will allow them to install base stations and customer units, an approach consistent with the Commission's usual designation of commercial spectrum. A geographic area licensing scheme is the only effective means of supporting the

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35/ *See Third Further Notice* ¶ 66.

36/ *See id.* ¶ 63 ("[W]e anticipate that there will be at least four types of non-Federal deployments in the Lower 37 GHz Band: point-to-point links (for example backhaul and backbone links); fixed wireless broadband systems (generally consisting of a fixed access point and fixed subscriber units); single base station IoT-type systems (for example, in a factory); and carrier-based deployments of mobile systems using the Lower 37 GHz Band as supplemental capacity[.]").

mobile system deployments the Commission expects in the Lower 37 GHz band.[37/] Other forms of use – as suggested in the *Third Further Notice*[38/] – can be accommodated within the service areas designated for mobile operations, although the Commission should refrain from too closely defining the use of the band as this could inhibit future innovation and technological growth.

While the Commission has rejected licensed use throughout the entire Lower 37 GHz band, the proposed rules – under which a new entrant would be allowed to license/register a facility only if it would not interfere or could be modified to not interfere with a previously licensed or registered site – is not realistic for terrestrial mobile services and will therefore inhibit use of the band. Under the Commission's proposal, once an operator licenses/registers a facility, builds its site, and initiates mobile service within its base station protection zone, no other operator could effectively initiate mobile service within that protection zone because the second operator would be required to coordinate its service with the first, to ensure that its service does not interfere with the first operator. There is no way to have two mobile units simultaneously use the same frequency at the same location without interfering with each other. Moreover, mobile service providers cannot accommodate other users being "engineered in" as commonly occurs in the Part 101 services on which proposals for use of this band are based.[39/] The Commission's proposals will therefore not result in sharing, but in a race to submit applications to license and register facilities. This result will disadvantage both smaller entities that may not have the resources to be the first to deploy in the band and federal entities eligible

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37/ As noted above, the Commission specifically contemplates that mobile operations will be one of the uses of the Lower 37 GHz band. *See Third Further Notice* ¶ 63.

38/ *See id.* ¶ 63.

39/ In contrast to Section 101.103 of the rules, which governs coordination of microwave stations, Section 30.204 provides power flux density ("PFD") limits that establish UMFUS licensee's rights relative to co-channel users.

to share the band, whose planning and funding cycles may not permit immediate access to the spectrum. Moreover, as noted below, the Communications Act specifically envisions the resolution of competing interests in the same spectrum in the same geographic area by auction, not a race to file.

In order to support mobile operations in the band as T-Mobile suggests, the Commission must also address how it will accommodate multiple requests for the same spectrum in the same geographic area. Any degree of protection, combined with mutually exclusive applications, means that the Commission must employ auctions to issue licenses. Section 309(j) of the Communications Act makes clear that the Commission must employ auctions when mutually exclusive applications are submitted.[40/] The Commission cannot evade that obligation by simply stating that initially submitted applications can preclude grant of those subsequently filed – as they would for mobile services. Of course, if the Commission allows protected use of Lower 37 GHz band frequencies for non-federal operations as T-Mobile proposes, the rules should also specify the usual terms for commercial services – for example, performance requirements and a renewal expectancy, to further encourage deployment and prevent spectrum warehousing.[41/]

Similarly, to promote commercial mobile use of the band, the Commission must reject the licensing and registration mechanism suggested by Starry,[42/] as well as the proposal by Intel, which would use a database similar to that used in the 70/80 GHz bands.[43/] The characteristics of the 70/80 GHz bands precisely demonstrate why any scheme that relies on prior coordination

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40/ 47 U.S.C. § 309(j).

41/ *See Third Further Notice* ¶ 67 (seeking comment on preventing warehousing).

42/ *See id.* ¶ 61; Starry Inc. *Ex Parte*, GN Dkt. No. 14-77, *et al.* (filed July 14, 2017).

43/ *See Third Further Notice* ¶ 61; Comments of Intel Corporation, GN Dkt. No. 14-177, *et al*. (filed Sept. 30, 2016).

with existing operations is inappropriate for mobile use. Those bands have long been recognized as supporting highly directional "pencil beam" technology, which allows multiple users to employ spectrum in a single geographic area without causing interference to each other. The Commission recently confirmed the continued use of the 70/80 GHz bands for fixed point-to-point links using this technology.[44/] This same use case will not necessarily be true for the Lower 37 GHz band; the band is adjacent to the Upper 37 GHz and 39 GHz bands, which may be used for mobile operations. For mobile operations – specifically contemplated by the Commission as one of the potential use cases for the band – protection from additional operations throughout a geographic area is required.

If the Commission does not provide non-federal users meaningful geographic area-based protection that would support mobile operations, but instead contemplates an opportunistic form of spectrum use, it should permit industry bodies, such as 3GPP, to determine how to authorize shared use of the band, as it has in other contexts.[45/] Whatever coordination mechanisms are adopted through that process will incorporate appropriate, agreed-upon interference protection criteria and be based on sound engineering practices. Those interference protection criteria should apply to both federal and non-federal users.

[44/] *See Use of Spectrum Bands Above 24 GHz For Mobile Radio Service; et al.,* Second Report and Order, Second Further Notice of Proposed Rulemaking, Order on Reconsideration, and Memorandum Opinion and Order, 32 FCC Rcd. 10988, ¶ 200 (2017).

[45/] *See, e.g., Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band,* Report and Order and Second Further Notice of Proposed Rulemaking, 30 FCC Rcd. 3959, ¶¶ 319, 373 (2015) (supporting industry creation of standards and best practices for Spectrum Access Systems in the 3.5 GHz band).

IV. FUTURE FEDERAL OPERATIONS IN THE 37 GHz BAND SHOULD BE CONSIDERED AS THE NEED DEVELOPS AND COORDINATION ZONES SHOULD BE APPROPRIATELY TAILORED

In the *Report and Order* in this proceeding, the Commission established a procedure for coordination with the existing 14 military sites and three scientific sites in the 37 GHz band, and it retained the ability for federal agencies to add future sites on a coordinated basis.[46/] The Commission now seeks comment on how best to accommodate any future federal sites in the 37 GHz band.[47/]

In the Lower 37 GHz band, future federal sites should be permitted in the manner described above. In the Upper 37 GHz band, the Commission should refrain from expanding the number of coordination zones or adopting broad coordination requirements, absent clearly defined federal needs. If federal users have access to the Lower 37 GHz band, it is not clear why they would also require additional access to the Upper 37 GHz band. As T-Mobile has explained, wireless network deployment requires a stable, predictable spectrum environment, and the Commission's rules should make as much spectrum as possible available for commercial use to meet consistanlty growing consumer demand. Accordingly, potential future federal operations in the Upper 37 GHz band should be limited, considered as those requirements develop, and coordinated between the non-federal licensee and the relevant federal agency.

T-Mobile agrees that the Commission should evaluate whether the current coordination zones can be reduced.[48/] NTIA has a successful track record of reducing coordination and

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46/ *Use of Spectrum Bands Above 24 GHz For Mobile Radio Service; et al.*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd. 8014, ¶ 149 (2016).

47/ *See Third Further Notice* ¶ 74.

48/ *See id.* (seeking comment on whether the coordination zones previously established in Section 30.205 of the rules may be reduced without adversely impacting federal operations).

protection zones after initial parameters are established.[49/] It should undertake the same effort here, and the rules should allow licensees to work with federal entities to operate within the coordination zones if possible.

V. THE COMMISSION SHOULD MAKE THE 26 GHz BAND AVAILABLE UNDER THE PART 30 RULES AND REJECT REQUESTS FROM AIRBORNE PLATFORM PROVIDERS

Flexible Use. The 26 GHz band is currently allocated primarily for federal government services, and its use has been thus far been limited.[50/] T-Mobile agrees that the 26 GHz band would make "a useful addition to UMFUS."[51/] The Commission should therefore (i) allocate the 26 GHz band for non-federal fixed and mobile use on under the Part 30 rules; (ii) license the band on a PEA basis consistent with other UMFUS bands; and (iii) license the band in 100 megahertz blocks, consistent with the proposals for the Upper 37 GHz, 39 GHz, 42 GHz, and 47 GHz bands.[52/]

As the Commission acknowledges, there is international momentum around use of the 26 GHz band for terrestrial 5G services and the band is being studied by the International Telecommunication Union for terrestrial mobile use.[53/] Global harmonization in the band, consistent with these regional and international efforts, would promote investment, allow for

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49/ *See, e.g., The Federal Communications Commission And The National Telecommunications And Information Administration: Coordination Procedures In The 1695-1710 MHz And 1755-1780 MHz Bands*, Public Notice, 29 FCC Rcd. 8527 (2014) (refining certain AWS-3 protection zones, reducing them from nationwide scope to more specific geographic areas).

50/ *See Third Further Notice* ¶ 79.

51/ *Id.* ¶ 78.

52/ *See Fourth Further Notice* ¶¶ 9-12.

53/ *See Third Further Notice* ¶¶ 75-76 (highlighting that the European Conference of Postal and Telecommunications Administrations ("CEPT") has adopted a preliminary determination to make the 24.25-27.5 GHz band a "clear priority" for harmonization of 5G services; that at least eight countries in other parts of the world are preparing to authorize terrestrial mobile services in this range; and that ITU-R Task Group 5/1 issued a set of preliminary technical analyses concluding that the band can be shared among terrestrial mobile and incumbent services).

economies of scale, and produce a robust equipment market, to the benefit of U.S. consumers. Moreover, equipment manufacturers can readily integrate the 26 GHz band into a tuning range that includes the 24 GHz and 28 GHz bands, which are already authorized for mobile services and for which equipment is already being developed and tested.[54/] As the Commission notes, this "presents three opportunities – first, to achieve manufacturing economies by covering several bands with a single radio; second, to provide international roaming capability in affordable user devices, and third, to accelerate the availability of equipment in newly authorized bands that share a tuning range with early deployed bands."[55/] The Commission should advance these opportunities and allocate the band for UMFUS use.

Protection of Incumbents. T-Mobile also agrees that UMFUS use can be authorized while protecting incumbent operations in the 26 GHz band.[56/] As the Commission notes, studies show that Earth Exploration Satellite Service and Space Research Service earth stations could be protected using protection zones, and there are established protocols for coordinating federal and non-federal point-to-point services that could serve as a model.[57/] The Commission should also ensure that any measures adopted to protect existing use are appropriately tailored to permit the greatest level of commercial access to the band.

Future Federal Use. The Commission should allow future federal use only if such use does not interfere with non-federal operations. As the Commission recognizes, federal use of the

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54/ *See Third Further Notice* ¶ 77; Martha DeGrasse, *In a season of 5G firsts, T-Mobile and Nokia announce a big one*, FIERCEWIRELESS (June 13, 2018), https://www.fiercewireless.com/wireless/t-mobile-and-nokia-complete-bi-directional-ota-5g-data-session.

55/ *Third Further Notice* ¶ 77.

56/ *See id.* ¶¶ 83-84 (discussing sharing in the 26 GHz band).

57/ *See id.*¶ 83.

26 GHz band has been limited.[58/] The 26 GHz band therefore has the potential to support significant, beneficial commercial use. The Commission should structure the rules to encourage that use, especially in light of the apparent lack of federal demand for the spectrum. Alternatively, as the Commission suggests,[59/] it may adopt an approach similar to the earth station siting policies that the Commission adopted for the 24 GHz, 28 GHz, 39 GHz, and 47 GHz bands.[60/]

Use by New Services. The Commission should reject requests from airborne platform providers to limit UMFUS use of the 26 GHz band.[61/] As T-Mobile has detailed, services such as those proposed by Elefante are untested services that, at best, *may* serve a niche market. Even if such a service is feasible, it would be less efficient than existing, proven services.[62/] Therefore, constraining the terrestrial use of the band would not serve the public interest. Elefante's proposal is highly speculative – it will not even have a prototype airship to begin testing until late 2020.[63/] Moreover, as others have pointed out, "the concept of a high-throughput HAPS network has been recycled several times without gaining traction in the United States."[64/] In contrast, terrestrial mobile broadband services have been widely deployed. If dedicated for terrestrial wireless use, the 26 GHz band would enable wireless providers to further densify their

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58/ *See id.* ¶ 84.

59/ *See id*.

60/ *See* 47 C.F.R. § 25.136; *Third Further Notice* ¶¶ 22-25.

61/ *See Third Further Notice* ¶ 86 (discussing the Elefante Group); *see also* Elefante Group, Inc., Petition to Modify Parts 2 and 101 of the Commission's Rules to Enable Timely Deployment of Fixed Stratospheric-Based Communications Services in the 21.5-23.6, 25.25-27.5, 71-76 and 81-86 GHz Bands, RM-11809 (filed May 31, 2018) ("Elefante Petition").

62/ *See* Opposition of T-Mobile USA, Inc., RM-11809 (filed July 11, 2018).

63/ *See* Elefante Petition at 20.

64/ Comments of Audacy Corporation, RM-11809, at 3 (filed July 11, 2018).

already far-reaching networks and provide greater speed and capacity to many more people, especially given the amount of spectrum available in the band.

Terrestrial wireless technologies may also deploy in the band sooner, bringing broadband to more people faster. As noted above, Elefante will not have a prototype airship to test until late 2020. Wireless providers, in contrast, are already conducting trials of 5G service in millimeter wave spectrum and deploying infrastructure. T-Mobile has announced that it will deploy 5G infrastructure in thirty markets by the end of the year and will have handsets in 2019.[65/]

Finally, if the Commission makes the spectrum available for flexible use, Elefante and others that propose similar services could participate in an auction to secure spectrum rights, assuming that the Commission can structure technical limitations that ensure that these systems do not cause interference to wireless terrestrial networks.

VI. THE COMMISSION SHOULD AUTHORIZE THE 50.4-52.6 GHz BAND FOR MOBILE USE AND LIMIT FURTHER FSS ACCESS TO THE 50.4-51.4 GHz BAND

The Commission proposes to adopt rules permitting individual FSS earth station licensing in the 50.4-51.4 GHz band using the same criteria applicable to the Upper 24 GHz band, in which aggregate population limits within the specified earth station PFD contour apply on a per-county basis.[66/] Also, as in the 47 GHz band, the Commission proposes constraints on the number of permitted earth stations per county and per PEA in which the earth stations are located.[67/]

65/ T-Mobile News Release, *T-Mobile and Nokia Ink $3.5 Billion, Multi-year 5G Network Agreement* (July 30, 2018), https://www.t-mobile.com/news/nokia-5g-agreement; T-Mobile News Release, *T-Mobile Building Out 5G In 30 Cities This Year…And That's Just The Start* (Feb. 27, 2018), http://investor.t-mobile.com/file/Index?KeyFile=392359656.

66/ *See Third Further Notice* ¶ 93. The 50.4-51.4 GHz band already includes primary federal and non-federal allocations for FSS (Earth-to-space).

67/ *See id*.

As the Commission notes**,** the 50.4-52.6 GHz band remains under consideration for UMFUS licensing.[68/] The Commission should act promptly to authorize this band for mobile use, and it should ensure that any actions it takes to grant additional limited access to FSS in the band do not inhibit terrestrial mobile use of the band. While the sharing frameworks for the 24 GHz, 28 GHz, and 47 GHz bands have not yet been implemented, their use presents a consistent approach across already allocated and, as T-Mobile has proposed here, additional millimeter wave bands. The Commission should go no further than this framework, which should be subject to reevaluation based on what occurs in practice in the other bands.

VII. CONCLUSIONS

The Commission should continue to move swiftly to make millimeter wave spectrum available in a manner that will best facilitate U.S. leadership in the race to 5G. Accordingly, the Commission should –

- Authorize UMFUS operations in the 42 GHz band and issue exclusive licenses in the band in 100 megahertz blocks on a PEA basis.
- Structure the rules for sharing between federal and non-federal users in the Lower and Upper portions of the 37 GHz band to promote certainty and the greatest amount of commercial use.
- Authorize licenses for non-federal users in the Lower 37 GHz band in a manner that meaningfully supports mobile operations.
- Authorize UMFUS operations in the 26 GHz band, issue exclusive licenses in the band in 100 megahertz blocks on a PEA basis, and reject requests from Elefante and proponents of similar HAPS to limit UMFUS use of the band.
- Authorize the 50.4-52.6 GHz band for UMFUS use and ensure that any actions granting additional limited access to FSS do not inhibit terrestrial mobile use of the band.

68/ *See id.* ¶ 94.

Respectfully submitted,

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